Strain-Rate and Temperature Dependence of Mechanical Behaviour in Germanium Crystals

ABSTRACTS OF PAPERS
Published in Other Journals

Strain-Rate and Temperature Dependence of Mechanical Behaviour in Germanium Crystals*

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Abstract

The stress-strain characteristics and the development of the dislocation structure in germanium crystals are investigated as dependent on the strain rate and the temperature. The results are interpreted in the light of the dislocation behaviour which has been clarified by the foregoing paper. The shape of the stress-strain curve is similar for any set of the strain rate and the temperature chosen. It is concluded that the higher density or the higher velocity of moving dislocations in crystals results in the higher flow stress and the larger strain in each deformation stage. The essential difference between stage I and stage II lies in the difference in the dislocation arrangement and not in the dislocation density. The mobile fraction of dislocations at lower yield point is estimated to be of the order of several percent. It is found that, once forest dislocations begin to be active, stage I is never restored by any choice of the strain rate or the temperature in the subsequent deformation.

* The **1544th** report of the Research Institute for Iron, Steel and Other Metals. Published in the Crystal Lattice Defects, **2** (1971), 147.